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UNITED STATES DEPARTMENT OF AGRICULTURE

DEPARTMENT BULLETIN No. 1198

Washington, D. C. ▼ April 16, 1924

COST OF PRODUCING WINTER WHEAT

IN CENTRAL GREAT PLAINS REGION OF THE UNITED STATES

By

R. S. WASHBURN, Assistant Farm Economist, Bureau of Agricultural Economics

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VALUE OF KNOWING COSTS.

Under present economic conditions it is increasingly important for farmers to know and analyze their production costs. The basis for intelligent farm organization consists of a knowledge of the relative profitableness of the various enterprises which may be suited to the particular locality. The choice of enterprises once being made, comparative costs of the different methods that may be employed serve as a guide for following those practices which will result in the highest net return. In farming, as in any other business, cost statements are desirable to point out the places where production costs should be lowered and to what extent operations can be expanded profitably.

The aim of this bulletin is to set forth a clear statement of the basic cost factors of winter wheat production, to indicate how these basic data may be used in calculating the cost of producing winter wheat, and to point out some of the factors which illustrate economy and efficiency in production.

CENTERS OF WHEAT PRODUCTION IN THE UNITED STATES.

In 1839 western New York and the region including southeastern Pennsylvania, western Maryland, and eastern Ohio were the principal wheat-producing centers of the United States, contributing

NOTE.—Acknowledgment is due to H. A. Miller and A. P. Brodell of the Bureau of Agricultural Economics and to A. F. Swanson, of the Bureau of Plant Industry, for assistance in collecting the field cost data contained in this bulletin. Thanks are extended to the many wheat farmers through whose courtesies the securing of the field data was made possible.

approximately 53 per cent of the total production in the United States. From these centers the wheat movement has been gradually westward. In 1859 the principal wheat-producing regions were

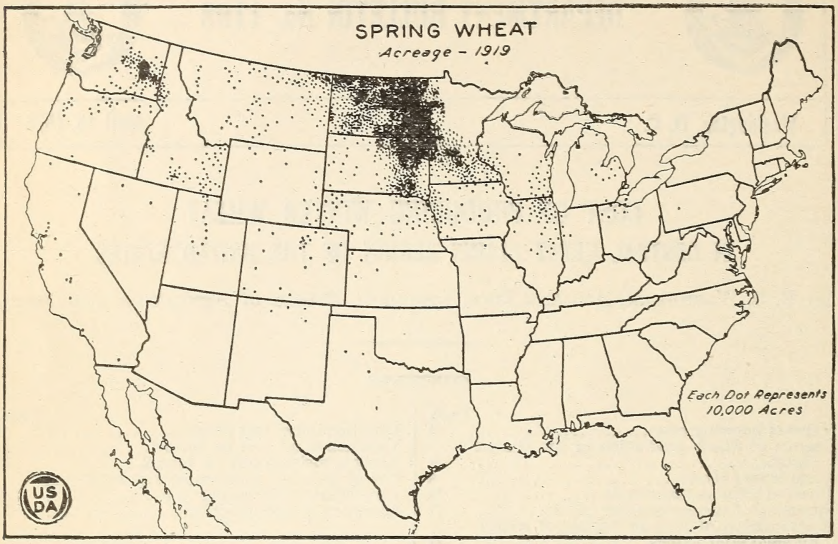


FIG. 1.—Distribution of spring wheat acreage in the United States, 1919.

western Ohio, Indiana, Illinois, southeastern Wisconsin, and southern Michigan. These States taken together contributed 46 per cent of the total production. The movement continued westward across

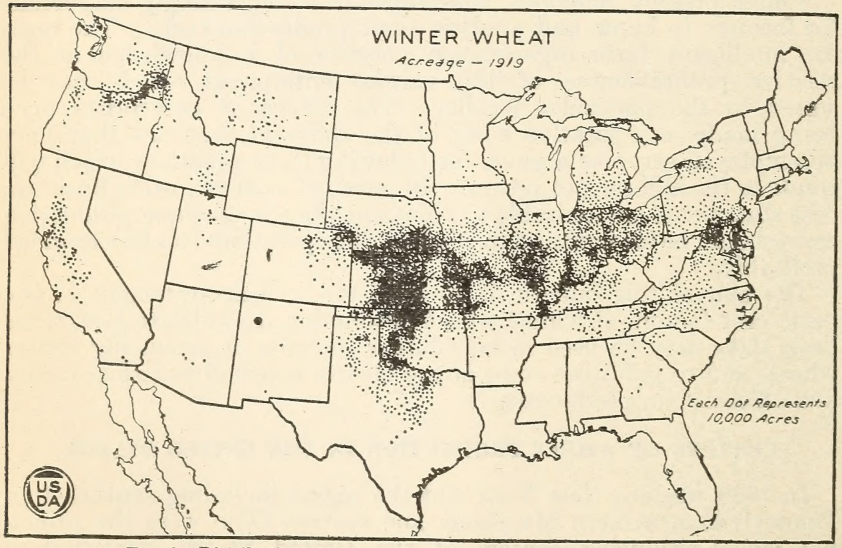


FIG. 2.—Distribution of winter wheat acreage in the United States, 1919.

Wisconsin into Minnesota and North and South Dakota, and through Illinois and Iowa, into Missouri, Kansas and Nebraska, so that, by 1889, these 6 States contributed about 36 per cent of the total production.

During the next three decades, the region of greatest acreage and heaviest production for both spring and winter wheat has centered in the Central Great Plains region. (See figs. 1 and 2.) In 1919 about 66 per cent of the total spring wheat acreage and 57 per cent of the total spring wheat production was in North Dakota, South Dakota, and Minnesota, and nearly 47 per cent of the total winter wheat acreage and 43 per cent of the total winter wheat production was in Kansas, Missouri, Nebraska and Oklahoma. (See Table 1). Minor wheat centers are found in eastern Oregon and Washington, southwestern Illinois and southeastern Pennsylvania, extending through Maryland into Virginia, with a fairly even distribution throughout Ohio, Indiana, and southern Michigan.

The southern boundary of winter wheat production is limited by an average temperature of 68° F. from about April 15 to June 15, or for two months preceding harvest, and more or less closely coincides with the northern boundary of the cotton belt. The northern boundary of winter wheat production coincides in a general way with the mean winter temperature line of 20°, and corresponds rather closely with the southern boundary of the spring wheat belt. The northern limit of spring wheat has a mean summer temperature of 58° F. which occurs in the United States only in the western mountains. The general northern boundary of spring wheat is in Canada.

TABLE 1.—*Acreage and production of wheat in the principal spring and winter wheat States,*[1] *1919.*

State.	Harvested acreage.	Percentage of United States wheat acreage.	Production.	Percentage of United States wheat production.
Spring wheat:				
North Dakota	7,770,000	33.3	53,613,000	25.6
South Dakota	3,650,000	15.7	29,200,000	14.0
Minnesota	3,950,000	16.9	36,735,000	17.5
Total	15,370,000	65.9	119,548,000	57.1
Winter wheat:				
Kansas	11,594,000	23.2	150,722,000	20.6
Missouri	4,274,000	8.6	57,699,000	7.9
Nebraska	3,716,000	7.4	54,997,000	7.5
Oklahoma	3,760,000	7.5	52,640,000	7.2
Total	23,344,000	46.7	316,058,000	43.2
Spring wheat, United States	23,338,000	.....	209,351,000	.....
Winter wheat, United States	49,905,000	.....	731,636,000	.....

[1] U. S. Dept. of Agriculture Yearbook, 1919.

BASIC FACTORS OF COST.

In areas of dense wheat production such as are found in the central Great Plains region of the United States, the wheat crop is the principal and sometimes the only source of income to the farmer. Under such conditions the question of costs and profits in wheat production is of vital importance.

Basic cost factors such as hours of man labor and horse labor, amounts of fertilizer, quantities of seed, etc., are desirable measures of cost. Cost items expressed as money units are subject to considerable change, especially during periods of wide price fluctuations. The same items, when expressed in terms of quantity requirements

of labor and materials, are much more stable and lend themselves better to analytical studies. An accumulation of such data serves as a basis for the timely estimating of costs which can not be made with any degree of accuracy without the use of such items. A close estimate of the cost per acre may be made by applying current prices to the basic quantity requirements of labor and materials, and by the use of the current yield a cost per bushel may be obtained. Such information serves as a basis for the approximate determination of costs at the end of each crop year before the crop is marketed.

Numerous basic cost data for the more important wheat areas are now available for such use. A part of these data have been published, and it is the aim of the Department of Agriculture to make additional information available as it is collected, with the hope that in time a solid foundation of such basic material will be available for the timely computing of costs in all of the principal wheat centers of the United States.

The present study of basic cost requirements, together with the acre and bushel costs, is for the crop year 1920. The data were obtained through personal visits to representative wheat growers in 10 counties of 4 important winter-wheat States. (See Table 2). In selecting these counties an attempt was made to choose districts illustrating the physical and economic influences affecting the basic requirements and costs. In these counties from 50 to 85 per cent of the total crop area was devoted to winter wheat.

Wherever possible the items of expense have been expressed in terms of physical quantities such as hours of labor, quantities of seed, and twine. Since costs vary widely because of differences in yield and in the amounts and prices of labor and materials, special attention has been given throughout this bulletin to such variations.

Items of cost have been considered in the following order: (1) Labor and power, which includes the direct man labor and horse and tractor power; (2) materials, including seed wheat, binder twine, barnyard manure and straw, and commercial fertilizers; (3) other costs, including farm taxes and insurance, special crop insurance, use of tractor and other farm machinery, loss on abandoned wheat acreage, overhead and interest on investment.

TABLE 2.—*Acreage and production of winter wheat on farms studied, by counties, 1920.*[1]

State and county.	Records.	Wheat seeded.	Volunteer wheat.	Wheat harvested.	Production.
	Number.	*Acres.*	*Acres.*	*Acres.*	*Bushels.*
Missouri:					
Pike County	58	2,388	.....	2,310	28,022
Carroll County	59	3,009	.....	3,009	54,402
Nebraska:					
Gage County	46	2,076	.....	2,019	38,231
Clay County	44	2,792	90	2,465	27,891
Cheyenne County	41	8,185	245	8,245	137,441
Kansas:					
Thomas County	43	11,008	2,273	12,756	174,411
McPherson County	38	4,789	.....	4,751	60,982
Pawnee County	35	13,073	535	11,119	139,059
Oklahoma:					
Garfield County	60	7,069	.....	7,066	127,560
Woodward County	43	7,354	206	5,647	60,338
Total	467	61,743	3,349	59,387	848,337

[1] Similar data were secured in 1919 on 197 spring-wheat farms and on 284 farms in winter-wheat States and are published in U. S. Department of Agriculture Bulletin 943, "Cost of producing wheat."

LABOR AND POWER REQUIREMENTS.

AVERAGE HOURS OF MAN AND HORSE POWER.

The average labor and power requirements shown in Table 3 are for those farms that were operated exclusively with horses.

The average man and horse hour requirements for land preparation and seeding showed considerable variation from county to county. They were highest in the two Missouri counties, where a relatively larger percentage of the acreage was covered with smaller tillage implements than those used in other counties. The requirements for harvesting and marketing represent the prevailing practice in cutting the grain and in providing labor for threshing.

A division of the labor as to land preparation and seeding, and harvesting and marketing, indicates that the man hours for the latter were slightly greater than for the former, while the horse hours for land preparation and seeding exceeded those required for harvesting and marketing in all cases except for volunteer wheat in Thomas County, Kans.

The average total hours of man labor per acre varied from 6.5 in Thomas County, Kans., to 16.6 in Carroll County, Mo. The average hours of horse labor in these two counties were 16.4 and 39.1. In Thomas County the hours for volunteer wheat were 5.3 and 11.5, respectively, for man and horse labor.

TABLE 3.—*Average man-labor and horse-power requirements per acre, winter wheat, 1920.*[1]

State and county.	Preparation and seeding.		Harvesting and marketing.					Total hours per acre.	
	Hours per acre.		Prevailing practice.			Hours per acre.			
	Man.	Horse.	Cut with—	Threshed from—	Part of threshing crew furnished by farmer.	Man.	Horse.	Man.	Horse.
Missouri:									
Pike County	7.4	24.6	Binder	Shock	All	7.1	9.6	14.5	34.2
Carroll County	7.3	26.1	do	do	do	9.3	13.0	16.6	39.1
Nebraska:									
Gage County	5.4	21.8	do	do	do	8.0	11.9	13.4	33.7
Clay County	4.3	18.3	do	do	do	5.5	9.5	9.8	27.8
Cheyenne County	3.4	14.0	do	do	Field pitchers.	5.2	9.8	8.6	23.8
Kansas:									
Thomas County—									
Seeded	1.9	8.1	Header	Stack	None	4.6	8.3	6.5	16.4
Volunteer	.7	3.2	do	do	do	4.6	8.3	5.3	11.5
McPherson County	4.5	18.5	Binder	Shock	Bundle haulers	4.0	7.5	8.5	26.0
	4.5	18.5	do	Stack	None	5.0	8.1	9.5	26.6
Pawnee County	2.2	10.6	Header	do	do	4.4	7.2	6.6	17.8
Oklahoma:									
Garfield County	4.9	20.1	Binder	Shock	do	4.3	6.9	9.2	27.0
Woodward County	3.8	14.4	Header	Stack	do	4.2	8.3	8.0	22.7

[1] The hours of labor do not include that part of the threshing crew furnished by the thresherman.

VARIATION IN MAN LABOR REQUIREMENTS.

Variation in the hours of man labor required to produce an acre of wheat was from less than 4 to over 20 per acre. Much of this variation was due to differences in regional methods of land preparation and harvesting and marketing. On one of the two farms with a

man-labor requirement of less than four hours per acre the wheat was drilled in on disk-harrowed stubble land (see fig. 3), while on the other farm the crop was seeded on listed land without additional preparation. Yields were very low on both farms, with the result that the time required for threshing and marketing was relatively low. The acreage in wheat on the farms with man-labor requirements of 20 hours and over per acre averaged less than 50 acres per farm; the land was given a thorough preparation and the yield of wheat was high, requiring a relatively long time to thresh and market.

In Missouri and in Gage County, Nebr., the majority of the farms are represented in the groups having man-hour requirements of from 10 to 18 hours per acre, while in all other counties the majority of the farms fall within the 4 to 12 hour group. For all farms 60 per cent had man-hour requirements of from 4 to 12 hours per acre, while 32 per cent had man-hour requirements ranging from 12 to 18 hours per acre.

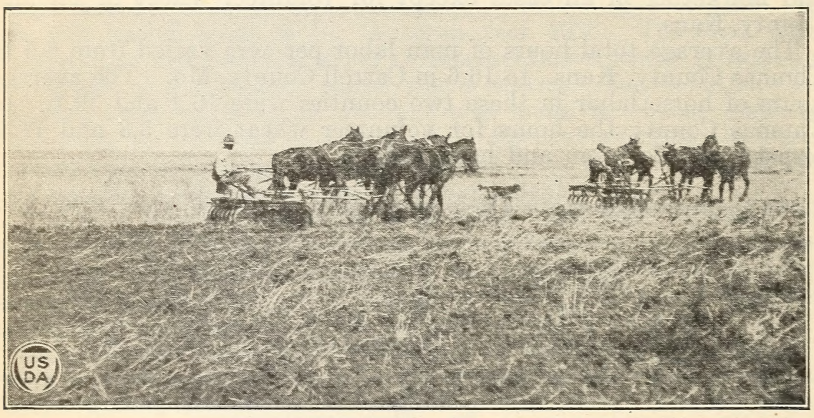


FIG. 3.—Disking stubble land prior to drilling wheat without further preparation. This is a common method of preparing the seed bed for wheat in Cheyenne County, Nebr.

The average man-hour requirement for all districts was 8.8 per acre, with a corresponding horsepower requirement of 23.6 hours per acre. Variation by groups of these requirements was from 3 to 22.6 man-hours per acre and from 8.1 to 50.2 horse hours per acre. (See Table 4.)

EFFECT OF USE OF TRACTOR ON TOTAL MAN AND HORSE HOUR REQUIREMENTS.

A comparison of the man and horse hours required to grow an acre of wheat on farms where no tractors were owned, with the man, horse, and tractor requirements per acre on farms where tractors were owned, is shown for three counties in Table 5. Although in each county the crop area per farm was larger on the tractor-owned farms than on those operated by horses, the tillable acreage per farm in each group is large enough to make the data comparable. The part of the total acreage covered by different operations varied considerably and these variations had a direct effect on the relative amount of work required per acre.

TABLE 4.—*Variation in man-labor requirements per acre, winter wheat, 1920.*
(Farms using tractors or trucks not included.)

Man hours per acre.	Missouri.				Nebraska.					
	Pike County.		Carroll County.		Gage County.		Clay County.		Cheyenne County.	
	Number of farms.	Acreage.	Number of farms.	Acreage.	Number of farms.	Acreage.	Number of farms.	Acreage.	Number. of farms.	Acreage.
Under 4									2	180
4 to 6							4	244	1	200
6 to 8	3	140			5	260	3	205		
8 to 10	7	507	2	45	6	346	8	695	1	140
10 to 12	10	356	4	196	10	529	2	215		
12 to 14	6	235	5	185	9	393	1	79		
14 to 16	8	355	7	308	1	32				
16 to 18	4	152	2	68	1	20				
18 to 20	3	41	6	243	1	18				
20 and above										
All farms	41	1,786	26	1,045	33	1,598	18	1,438	4	520

Man hours per acre.	Kansas.						Oklahoma.				All farms.			
	Thomas County.		McPherson County.		Pawnee County.		Garfield County.		Woodward County.		Total.		Average hours per acre.	
	Number of farms.	Acreage.	Number of farms.	Acreage.	Number of farms.	Acreage.	Number of farms.	Acreage.	Number of farms.	Acreage.	Number of farms.	Acreage.	Man.	Horse.
Under 4					1	320			1	170	2	490	3.0	8.1
4 to 6	6	1,945	1	55	5	1,500			4	970	18	4,650	5.3	14.7
6 to 8	8	1,290	1	280	8	1,768	2	295	11	1,847	35	5,924	7.0	19.6
8 to 10	1	60	5	510	5	1,060	13	1,642	6	838	41	4,715	8.7	24.8
10 to 12			4	410			2	275	4	457	34	2,875	10.8	29.8
12 to 14			2	123			2	160			30	1,579	13.0	31.8
14 to 16							1	160			22	1,052	14.7	36.8
16 to 18											16	695	16.8	38.4
18 to 20											7	240	18.7	40.2
20 and above											10	302	22.6	50.2
All farms	15	3,295	13	1,378	19	4,648	20	2,532	26	4,282	215	22,522	8.8	23.6

In Cheyenne County, Nebr., where tractors were owned, a greater percentage of the acreage was covered for most operations than where tractors were not owned, and a much larger percentage of this work was performed by the tractor than by horsepower. Notwithstanding this fact the man labor per acre was 4.1 hours less for the farms where tractors were used. On the other hand, in McPherson County, Kans., and Garfield County, Okla., about the same amount of total work was done on the farms in each group. However, the percentage of this work done with horses on the farms where tractors were owned was much greater in these two counties than in Cheyenne County, Nebr., resulting in a saving in time of only one man hour per acre for farms on which tractors were owned.

These comparisons show that the use of tractor power in wheat production results in a material saving of time, the amount of which depends largely on the intensity of use of the tractor.

TABLE 5.—*Effect of use of tractor on total man and horse hour requirements per acre, winter wheat, 1920.*

Cheyenne County, Nebr.	Farms operated by horse power.			Farms operated by horse and tractor power.				
	11 farms, 191 crop acres per farm.			23 farms, 374 crop acres per farm.				
	Hours per acre.		Percentage of acreage covered.	Hours per acre.			Percentage of acreage covered.	
	Man.	Horse.		Man.	Horse.	Tractor.	Man and horse.	Man and tractor.
Labor and power:								
Prepare land and seed	3.8	15.2		1.8	0.8	1.2		
Harvest and market	6.6	10.9		4.5	4.9	.4		
Total	10.4	26.1		6.3	5.7	1.6		
Wheat acreage:								
Plowed			36				1	58
Disked			76				1	83
Harrowed[1]			34				19	5
Drilled			100				20	80
Cut			100				22	78

McPherson County, Kans.	24 farms, 177 crop acres per farm.			13 farms, 243 crop acres per farm.				
	Hours per acre.		Percentage of acreage covered.	Hours per acre.			Percentage of acreage covered.	
	Man.	Horse.		Man.	Horse.	Tractor.	Man and horse.	Man and tractor.
Labor and power:								
Prepare land and seed	4.3	18.3		3.2	6.9	1.3		
Harvest and market	4.3	7.1		4.4	5.6	.2		
Total	8.6	25.4		7.6	12.5	1.5		
Wheat acreage:								
Plowed			84				18	74
Disked			26				14	4
Harrowed[1]			242				140	87
Drilled			100				80	20
Cut			100				47	53

[1] The percentage of the acreage covered with the harrow reflects both the acreage harrowed and the number of times harrowed.

TABLE 5.—*Effect of use of tractor on total man and horse hour requirements per acre, winter wheat: 1920*—Continued.

Garfield County, Okla.	41 farms, 157 crop acres per farm.			10 farms, 205 crop acres per farm.				
	Hours per acre.		Percentage of acreage covered.	Hours per acre.			Percentage of acreage covered.	
	Man.	Horse.		Man.	Horse.	Tractor.	Man and horse.	Man and tractor.
Labor and power:								
Prepare land and seed	4.7	19.3	.....	3.5	8.3	1.3	.....	.....
Harvest and market	4.6	7.3	.....	4.8	6.3	.3	.....	.....
Total	9.3	26.6	.....	8.3	14.6	1.6	.....	.....
Wheat acreage:								
Plowed	.....	.....	99	.....	.....	.....	18	80
Disked	.....	.....	.....	.....	.....	.....	22	21
Harrowed [1]	.....	.....	200	.....	.....	.....	116	5
Drilled	.....	.....	100	.....	.....	.....	93	7
Cut	.....	.....	100	.....	.....	.....	48	52

[1] The percentage of the acreage covered with the harrow reflects both the acreage harrowed and the number of times covered.

REQUIREMENTS OF MAJOR FIELD OPERATIONS WHEN DONE WITH HORSE AND WITH TRACTOR POWER.

Greater amounts of labor and power are required for plowing than for most other operations involved in wheat growing. The average man hours for plowing with tractor power were 1.4 less per acre than when this operation was performed with horsepower and 1.2 hours of tractor power were required as against 11.2 hours of horsepower. A similar relation with respect to man labor exists for all other operations except harvesting with the binder. On these farms for this work a man was used to operate the binder in addition to the tractor operator, which served to increase the man hours required for this operation when performed by tractor power. (See Table 6.)

TABLE 6.—*Comparison of requirements per acre of major field operations when done with horse and with tractor power, winter wheat, 1920.*

Operation.	Man and horse.			Man and tractor.		
	Number reporting.	Hours per acre.		Number reporting.	Hours per acre.	
		Man.	Horse.		Man.	Tractor.
Plowing	301	2.7	11.2	82	1.3	1.2
Disking	216	1.2	5.0	53	.6	.6
Harrowing	331	.4	2.1	25	.3	.3
Drilling	421	.7	2.8	39	.5	.4
Cutting (with binder)	326	.7	3.0	66	1.0	.5

HARVESTING AND THRESHING REQUIREMENTS.

Labor and power requirements as shown in Table 7 represent the three prevailing methods employed in harvesting and threshing wheat in the counties studied. Requirements for harvesting and threshing with the combine represent work done exclusively by tractor power

while requirements for harvesting with the header and binder are for horse-propelled machines. Of the three methods, the use of the combine resulted in the greatest saving of man labor. Slightly greater amounts of labor and power were required for harvesting and threshing with the binder and thresher than with the header and thresher. In Missouri, and in Gage and Clay Counties, Nebr., the entire wheat acreage was cut with a binder. (See fig. 4.) In the more westerly areas the header was substituted for the binder on a majority of the farms. (See fig. 5.) Use of the combine was not common except in Cheyenne County, Nebr. (See fig. 6.)

FIG. 4.—Harvesting wheat with a binder. Forty-nine per cent of the total winter wheat acreage included in the study was harvested with a binder. Courtesy of Kansas State Board of Agriculture.

TABLE 7.—*Labor and power requirements for harvesting and threshing winter wheat, 1920.*

Method.	Hours per acre.		
	Man.	Horse.	Tractor.
Combine:			
Cutting and threshing	1.3	.....	0.6
Hauling to bin	.9	1.8	.....
Total	2.2	1.8	.6
Header and thresher:			
Heading and stacking	2.8	4.3	.....
Threshing from stack	1.5	.....	.2
Hauling to bin	.8	1.3	.....
Total	5.1	5.6	.2
Binder and thresher:			
Cutting	.7	2.8	.....
Shocking	.9	.....	.....
Hauling to thresher	1.6	3.2	.....
Threshing from stack	1.4	.....	.5
Hauling to bin	.7	1.2	.....
Total	5.3	7.2	.5

MATERIAL REQUIREMENTS.

Seed.—Varieties of soft winter wheat such as Harvest Queen and Fultz predominated in Missouri, while in all other districts hard winter wheat was most in evidence. Of the hard winter wheat varieties, Turkey Red was the most common.

There seems to be a rather well defined relation between the average annual rainfall and the quantity of seed sown per acre. An insufficient amount of moisture in the soil renders it incapable of supporting a heavy growth of wheat; as a result, less seed is used than where moisture is not a limiting factor. Rate of seeding ranged from an average of 0.74 of a bushel in Thomas County, Kans., a region of limited rainfall, to 1.3 bushels per acre in Pike County, Mo., a region

FIG. 5.—Harvesting wheat with a header. Forty-seven per cent of the total winter wheat acreage included in the study was harvested with a header. Courtesy of Kansas State Board of Agriculture.

of abundant rainfall. No appreciable amount of reseeding was necessary except in Pawnee County, Kans., where 2.2 per cent of the planted acreage was reseeded. This reseeding was caused by a lack of moisture at planting time, which resulted in considerable soil blowing. (Table 8.)

Binder twine.—The average binder-twine requirements were influenced mainly by the quantity of straw per acre and varied from about 1.5 pounds per acre in Pike County, Mo., to 2.5 pounds in Garfield County, Okla. The average requirement for all acreage cut with the binder was 2.24 pounds per acre. (Table 8.)

Commercial fertilizer.—Commercial fertilizer was not used on any farms visited except in Pike County, Mo., where 93 per cent of the men interviewed used commercial fertilizer covering 92 per cent of the entire wheat acreage. The quantity applied ranged from 100 to 200 pounds with an average application of 151 pounds per acre. (See Table 8.)

TABLE 8.—*Material requirements, winter wheat, 1920.*

State and county.	Seed.		Binder twine.		Manure and straw.	Commercial fertilizer.		
	Percentage of acreage reseeded.	Bushels per acre (one seeding).	Percentage of acreage cut with binder.	Pounds per acre.	Percentage of farmers reporting.[1]	Percentage of farmers reporting.	Percentage of total acreage covered.	Pounds per acre.
Missouri:								
Pike County	0.1	1.30	100	1.49	51	93	92	151
Carroll County	.2	1.23	100	2.20	46	.....	.....	.....
Nebraska:								
Gage County	.1	1.28	100	2.35	53	.....	.....	.....
Clay County	.4	1.21	100	2.41	40	.....	.....	.....
Cheyenne County	.....	.77	77	2.22	11	.....	.....	.....
Kansas:								
Thomas County	.3	.74	6	2.45	12	.....	.....	.....
McPherson County	.....	1.06	82	2.03	41	.....	.....	.....
Pawnee County	2.2	.94	15	2.47	24	.....	.....	.....
Oklahoma:								
Garfield County	.5	1.07	87	2.49	39	.....	.....	.....
Woodward County	1.0	.87	6	1.89	67	.....	.....	.....
All farms	.7	.95	49	2.24	39	11	4	151

[1] A relatively large percentage of the men interviewed used some manure and straw, but since it was applied only on selected parts of the wheat field the rate of application was not determined

OTHER COST FACTORS.

Taxes and insurance.—On owned land, the percentage that the investment in wheat land is of the total investment in real estate, livestock, and equipment represents the proportion of the total real

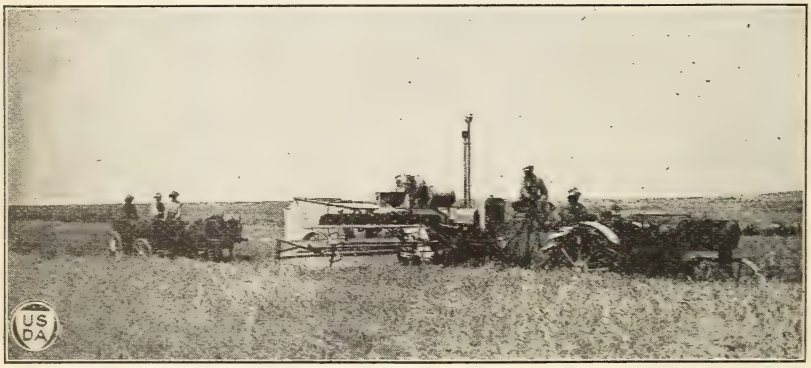


FIG. 6.—Harvesting wheat with a harvester-thresher or combine. Four per cent of the total winter wheat acreage included in the study was harvested with a combine.

estate taxes and insurance that has been charged to the wheat land, the insurance and personal tax on livestock and equipment being carried indirectly through the overhead charge. On rented farms land taxes and building insurance were paid by the landlord. Taxes and insurance on livestock and equipment paid by the renter have been charged indirectly, wheat receiving its proportionate share through the overhead charge. The special crop insurance includes fire insurance on stacked and stored grain, and hail insurance on the growing crop. (See Table 9.)

Use cost of tractor.—The annual farm use cost of tractors includes repairs, fuel, oil, and depreciation. This yearly farm cost divided

by the total number of hours the tractor was used during the year gave the average hour cost of running the tractor. The number of hours the tractor was used in wheat production, multiplied by the cost per hour, gave the total tractor use cost chargeable to wheat. (See Table 9.)

Use cost of general farm machinery.—The items comprising the total charge for use of general farm machinery include depreciation and the annual repairs expended in maintaining this equipment. The total annual charge for its use has been prorated to the productive crop and livestock enterprises on the farm in proportion to the number of horse hours of work required for their production and maintenance. Where farm machinery was hired for use in producing the wheat crop the actual cash paid out was charged. (See Table 9.)

Loss due to abandoned wheat acreage.—On many farms a portion of the seeded acreage was not harvested because the crop was either totally destroyed or so badly damaged that it was not worth cutting. In Clay County, Nebr., Pawnee County, Kans., and Woodward County, Okla., over 50 per cent of the growers interviewed reported some abandoned wheat acreage. Expressed in percentage of total acreage seeded, the abandoned acreage in these counties was as follows: Clay County, 15 per cent; Pawnee County, 19 per cent; Woodward County, 26 per cent. All costs for labor, seed, manure, use of land unless recropped, taxes and insurance, etc., expended on this abandoned acreage make up the charge for loss due to abandoned wheat acreage. When pastured, credit has been given for the value of the pasture consumed. The total cost of abandoned acreage in the region divided by the acreage harvested is the average abandoned acreage cost per harvested acre. (See Table 9.)

Overhead.—Those miscellaneous overhead expenses which are a part of every productive crop and livestock enterprise, but which are so general that they can not be charged directly to any one single farm enterprise, have been grouped and prorated to the wheat account and other productive enterprises on these farms in proportion to the direct expense for labor, materials, and threshing required by each. This miscellaneous expense includes such items as interest and taxes on barn lots and fence rows, and labor and cash expense for building and fence maintenance.

The total amount of the overhead expense as determined on representative wheat farms in those districts where corn and oats are rotated more or less regularly with wheat, namely, Missouri, and Gage and Clay Counties, Nebr., shows that this expense amounts to approximately 12 per cent of the combined value of the labor, materials, and threshing costs. In all other districts where the type of farming is less diversified and wheat production constitutes by far the largest single enterprise on the farm, the overhead is equivalent to approximately 15 per cent of the combined labor, material, and threshing costs. (See Table 9.)

Interest on investment.—An interest rate of 6 per cent on the investment was used for the two Missouri counties and Gage County, Nebr., and 7 per cent was used for all other counties. Because of lower land values in Thomas and Pawnee Counties, Kans., and Woodward County, Okla., interest on investment in wheat land in these counties is considerably lower than in the other counties studied. (See Table 9.)

TABLE 9.—*Other cost factors, winter wheat, 1920.*

State and county.	Taxes and insurance on owned land, average cost per acre.	Special crop insurance.		General farm machinery, rate per horse hour.	Tractor.	
		Percentage of farms reporting.	Average cost per acre insured.		Percentage of farms reporting.	Rate per hour of use.
Missouri:						
Pike County	$0.51	22	$0.14	$0.061	4	$0.76
Carroll County	.54	46	.30	.054	19	1.23
Nebraska:						
Gage County	.96	35	.40	.054	5	1.89
Clay County	.73	50	.35	.046	8	1.88
Cheyenne County	.40	74	1.64	.081	71	1.88
Kansas:						
Thomas County	.24	81	.78	.064	26	2.14
McPherson County	.98	49	.23	.062	35	1.97
Pawnee County	.70	81	.91	.081	33	2.53
Oklahoma:						
Garfield County	.82	37	.43	.080	19	2.21
Woodward County	.36	27	.33	.063	8	1.23
All farms	.55	48	.82	.065	21	1.98

State and county.	Loss due to abandoned acreage.		Overhead.	Value of wheat land per acre.	Interest on investment per acre.	
	Percentage of seeded acreage abandoned.	Average cost per acre abandoned.	Percentage of labor, materials, and threshing.		Wheat land.	Tractor and general farm machinery.
Missouri:						
Pike County	3.3	$15.76	12	$126	$7.59	$0.66
Carroll County			12	176	10.53	.77
Nebraska:						
Gage County	2.7	10.43	12	233	14.00	.64
Clay County	14.9	9.16	12	187	13.11	.46
Cheyenne County	2.3	8.29	15	114	7.98	.93
Kansas:						
Thomas County	4.8	6.40	15	68	4.74	.36
McPherson County	.8	9.65	15	144	10.05	.58
Pawnee County	19.0	8.43	15	86	6.05	.54
Oklahoma:						
Garfield County	.1	28.68	15	123	8.59	.84
Woodward County	26.0	8.01	15	40	2.79	.44
All farms	9.2	8.29	14.2	104	7.04	.61

PRICES OF LABOR AND MATERIALS.

Man labor rate.—The man labor rates as given in Table 10 are averages of the individual month and day wage paid for farm labor at the period at which the work was done, including board when furnished. A labor rate based on wages paid on individual farms rather than a flat rate for all farms better serves to bring out the variations in labor costs on individual farms, which in turn is reflected in the final unit cost of wheat. The labor of the farmer and the members of his family was charged at the rate which would have been paid had this work been hired. Labor prior to harvesting was usually performed by the farmer with the aid of hands hired by the month. During the harvesting period, however, because of the scarcity of hired hands and the transient character of the labor employed, practically all labor was hired on a day basis at a much higher wage.

For this reason a rate has been determined for land preparation and seeding and another rate for harvesting and marketing. The wage paid during the harvest period was governed mainly by the compe-

tition for farm labor at that time. Farmers in the wheat areas farther west paid a relatively higher wage than was paid in the areas farther east where the wheat acreage was smaller and the competition for labor less keen.

Horse power rate.—The horse power rates are flat rates for each county studied and are based partially on farmers' estimates and partially on records relative to the cost of keeping horses which were available for some of the regions in which this investigation was made. (See Table 10.)

Seed and seed treatment.—The value of seed wheat per bushel is an average of the estimates of individual farmers visited. Some growers bought high-grade recleaned seed and some used their farm supply for sowing. The figures given include the value of any materials used for seed treatment. All farm-produced seed was charged at its farm-sale value at planting time. (See Table 10.)

Manure and straw.—The proportion of the value of the manure and straw that should be charged to the year in which the application is made depends so much on the soil and other influencing factors that it is difficult to determine, but it is apparent that there is a residual value that should be taken into account. In the case of wheat, when applied directly, 50 per cent of the estimated value was charged; when applied to the crop immediately preceding, 30 per cent was charged, and when two other crops preceded, 20 per cent was charged to the wheat.

The figures on manure values are the estimates of individual farmers visited and would seem to indicate that its regional value depends primarily on the amount of moisture available to make it valuable as a plant food. The estimated values varied from an average of 51 cents per ton in Woodward County, Okla., to $2.21 per ton in Pike County, Mo. (See Table 10.)

Commercial fertilizer.—Since the fertilizer used on wheat was of a kind that became readily available as a plant food, the total value was charged to the year's crop.

The range in cost of fertilizer was from $30 to $50 per ton with an average cost of about $39 per ton. (See Table 10.)

TABLE 10.—*Prices of labor and materials, winter wheat, 1920.*

State and county.	Labor rates per hour.				Materials.			
	Preparation and seeding.		Harvesting and marketing.		Seed per bushel.	Binder twine per pound.	Manure and straw per ton.	Fertilizer per ton.
	Man.	Horse.	Man.	Horse.				
Missouri:								
Pike County	$0.27	$0.17	$0.46	$0.17	$2.17	$0.18	$2.21	$39.00
Carroll County	.30	.17	.56	.17	2.15	.17	1.40	.....
Nebraska:								
Gage County	.32	.15	.55	.15	2.16	.17	1.21	.....
Clay County	.27	.15	.60	.15	2.15	.16	.80	.....
Cheyenne County	.50	.17	.68	.17	2.10	.19	.54	.....
Kansas:								
Thomas County	.38	.17	.73	.17	2.15	.17	.57	.....
McPherson County	.38	.15	.68	.15	2.28	.16	1.06	.....
Pawnee County	.31	.15	.75	.15	2.19	.18	.75	.....
Oklahoma:								
Garfield County	.36	.15	.58	.15	2.13	.17	.85	.....
Woodward County	.30	.17	.65	.17	2.06	.17	.51	.....

THRESHING PRACTICES AND RATES.

The proportion of the threshing crew furnished by the farmer and by the thresherman was an influencing factor on the rate paid per bushel for threshing. In Missouri, and in Gage and Clay Counties, Nebr., the usual custom was for the farmer to furnish the entire threshing crew. In these counties, under these conditions, the average threshing rate varied from 10 cents per bushel in Gage County to 14 cents in Clay County, Nebr. On those farms where the thresherman furnished the entire crew, the average rate varied from 15 cents per bushel for headed grain in Thomas County, Kans., to 32 cents for shock threshed grain in Carroll County, Mo. In counties where shock threshing was practiced and the field pitchers were furnished by the thresherman and the bundle haulers by the farmer, the threshing rate varied from an average of 12 cents per bushel in Cheyenne County, Nebr., to an average of 19 cents in McPherson County, Kans. (See Table 11.)

TABLE 11.—*Threshing practices and rates, winter wheat, 1920.*

PREVAILING THRESHING PRACTICES.[1]

State and County.	Threshing done from—	Part of crew furnished by—		Per cent of production.	Average rate per bushel.	Average cost per acre for region (owned farms).
		Thresherman.	Farmer.			
Missouri:						
Pike County	Shock		All	98	$0.12	$1.61
Carroll County	Shock		All	68	.12	2.80
	Shock	All		28	.32	
Nebraska:						
Gage County	Shock		All	95	.10	2.28
Clay County	Shock		All	86	.14	1.75
	Stack (bundle grain)		All	11	.14	
Cheyenne County	Shock	Field pitchers	Bundle haulers	36	.12	1.78
	Shock		All	30	.11	
Kansas:						
Thomas County	Stack (headed grain)	All		94	.15	2.10
McPherson County	Shock	Field pitchers	Bundle haulers	46	.19	2.53
	Stack (bundle grain)	All		33	.17	
	Stack (headed grain)	All		19	.18	
Pawnee County	Stack (headed grain)	All		84	.17	2.34
Oklahoma:						
Garfield County	Shock	All		63	.31	4.33
	Shock	Field pitchers	Bundle haulers	15	.16	
Woodward County	Stack (headed grain)	All		81	.22	2.03

[1] In every case the thresherman furnished the crew for operating the separator and engine and the farmer furnished the men and horses for taking care of the threshed grain.

CREDITS.

The value of the items which have been reported as a credit resulting from the use or sale of wheat straw, the pasturing of the growing crop, and insurance received for losses to the wheat crop by fire or hail damage, is given in Table 12.

A majority of the farmers considered the straw of little money value and often only that portion needed for bedding was saved. The remainder was left to rot or was burned in stacks in the field.

The highest credits for straw occurred in Pike and Carroll Counties, Mo., where the acreage of wheat per farm was relatively small and the amount of livestock per farm relatively large, requiring a considerable amount of straw for the use of this stock. Only a limited acreage of growing wheat was pastured and in only six instances was insurance received for losses by fire or hail damage. The average total credit was small, amounting to only 43 cents per acre.

TABLE 12.—*Credits per acre, winter wheat, 1920.*

(216 OWNED FARMS.)

State and county.	Straw.	Pasture.	Special crop insurance received.	Total.
Missouri:				
Pike County	$1.00	$0.09		$1.09
Carroll County	.59	.12		.71
Nebraska:				
Gage County	.37	.11		.48
Clay County	.16	.03		.19
Cheyenne County	.06	.04	$0.20	.30
Kansas:				
Thomas County	.13	.24		.37
McPherson County	.10			.10
Pawnee County		.15	.54	.69
Oklahoma:				
Garfield County	.10	.16		.26
Woodward County	.13	.21		.34
All farms	.18	.15	.10	.43

SUMMARY OF AVERAGE COSTS BY TENURE.

The wheat land classified on the basis of tenure shows that the owner and share rent systems are the only tenure systems found on the farms visited. In Missouri the one-half share rental system prevailed. In all other areas except Gage County, Nebr. where the three-fifths share rental system was common, the two-thirds share system predominated.

Under the one-half share rental method the usual custom was for the landlord to maintain the buildings and fences, to furnish the planting seed and to pay all of the real estate taxes and half of the threshing expense. He received half of the wheat produced. The tenant furnished all work stock and equipment and paid all other operating expenses. In Pike County the landlord usually paid for all the fertilizer. Where the landlord received one-third or two-fifths of the crop, with very few exceptions he maintained the buildings and fences and paid the land tax, and the tenant-operator furnished all work stock and equipment and paid all other cash operating expense.

The costs are based on the 1920 yields for the farms visited. The average acre cost of each item of expense is a weighted average computed by dividing the total cost of each item by the total harvested wheat acreage. This method results in a relatively low regional cost per acre for those items of expense that do not apply to the entire acreage, as is illustrated in the case of binder twine on the owner farms in Thomas County, Kans., where only 6 per cent of the harvested acreage was cut with a binder, resulting in an average cost for binder twine of only 1 cent per acre.

The data have been itemized by districts so that the cost of any one item can be readily compared one district with another, and, in order that the relative importance of all related cost items may be readily appreciated, these items for each district have been grouped together under four headings: Labor, materials, threshing, and other costs.

The cost has been determined, excluding all interest charges to show the net operating expense, as well as the net cost, including interest as a cost item.

An analysis of the total operating expense by counties for all winter wheat produced on owned land (see Table 13) shows that labor constitutes about 42 per cent; materials, 14 per cent; threshing, 13 per cent; and other costs, 31 per cent of the total operating expense.

With interest included, the division was as follows: Labor, 30 per cent; materials, 10 per cent; threshing, 9 per cent; interest, 29 per cent; and other costs, 22 per cent. The average net operating expense was $1.25 per bushel, varying from an average of $0.90 in Thomas County, Kans., to an average of $1.96 in Woodward County, Okla. With interest on equipment and land included, the average net cost per bushel was $1.80 with a variation of from $1.26 in Thomas County, Kans., to $2.57 in Clay County, Nebr.

The operating expense per acre to tenant-operators (Table 14) was relatively lower than to owner-operators, because in some counties, more especially in the two Missouri counties, a part of the "materials" and "other costs" items were paid by the landlord.

On the other hand, because the cost to the tenant operator was based on his share of the cost divided by his share of the crop, the operating expense per bushel was relatively higher to tenants than to owners. In all counties except Pike County, Mo., and Cheyenne County, Nebr., the expense for labor was slightly greater for tenant than for owner operators. The percentage distribution on tenant farms was about the same as on owned farms. For all tenant farms the average net cost per bushel was $1.83 as compared with a net cost per bushel of $1.80 on owned farms.

In a study of the average costs on owned and on rented land it should be kept in mind that many of the cost items are noncash. Studies of the cost of producing wheat in other regions indicate that about 50 per cent of the cost of producing an acre of wheat is represented by money actually paid out.

TABLE 13.—*Summary of average net cost per acre and per bushel to owner operators, winter wheat, 1920.*

(216 owned farms.)

Items.	Missouri.		Nebraska.		
	Pike County.	Carroll County.	Gage County.	Clay County.	Cheyenne County.
Average yield per acre (bu.)	13.5	17.6	21.5	13.1	19.0
Operating expense per acre:					
Labor and power—					
Prepare land and seed—					
Man labor	$1.99	$1.94	$1.77	$1.57	$1.02
Horse power	3.69	3.93	3.30	3.08	.61
Contract labor	----	.33	----	.06	.79
Harvest and market—					
Man labor	3.54	4.81	4.83	3.83	2.83
Horse power	1.64	1.91	1.82	1.45	1.00
Contract labor	.08	.08	.06	----	.23
Material costs—					
Seed	2.86	2.65	2.73	2.57	1.67
Binder twine	.30	.32	.41	.38	.30
Manure and straw	.95	.39	.36	.20	.09
Fertilizer	2.65	----	----	----	----
Threshing	1.61	2.80	2.28	1.75	1.78
Other costs—					
Taxes and insurance	.51	.54	.96	.73	.40
Special crop insurance	.09	.16	.20	.27	1.53
Use of general farm machinery	2.25	2.44	2.12	1.26	2.37
Use of tractor and combine	.29	.23	.10	----	2.50
Loss on abandoned acreage	.69	----	.08	1.33	.18
Overhead	2.26	2.25	2.06	1.74	1.54
Total	25.40	24.78	23.08	20.22	18.64
Credits	1.09	.71	.48	.19	.30
Net operating expense:					
Per acre	24.31	24.07	22.60	20.03	18.34
Per bushel	1.81	1.36	1.05	1.54	.96
Interest on investment:					
Land and machinery	8.25	11.30	14.64	13.57	8.91
Net cost, including interest:					
Per acre	32.56	35.37	37.24	33.60	27.25
Per bushel	2.41	2.01	1.73	2.57	1.43

TABLE 13.—*Summary of average net cost per acre and per bushel to owner operators, winter wheat, 1920*—Continued.

Items.	Kansas.			Oklahoma.		All winter wheat.	Per cent of operating cost.
	Thomas County.	McPherson County.	Pawnee County.	Garfield County.	Woodward County.		
Average yield per acre (bu.)	14.1	14.6	12.1	18.4	9.5	14.9	
Operating expense per acre:							
Labor and power—							
Prepare land and seed							17.9
Man labor	$0.49	$1.72	$0.87	$1.53	$1.51	$1.24	
Horse power	.80	2.60	1.45	2.60	2.38	2.01	
Contract labor	.21	.23		.06		.17	
Harvest and market							24.1
Man labor	2.53	2.79	3.36	2.68	2.52	3.01	
Horse power	1.08	1.09	1.09	1.09	1.38	1.23	
Contract labor	1.08	.04	.47	.11	.09	.35	
Material costs							13.7
Seed	1.59	2.44	2.27	2.34	1.78	2.10	
Binder twine	.01	.26	.06	.35	.01	.18	
Manure and straw	.01	.25	.04	.08	.06	.16	
Fertilizer						.18	
Threshing	2.10	2.53	2.34	4.33	2.03	2.50	13.1
Other costs							31.2
Taxes and insurance	.24	.98	.70	.82	.36	.55	
Special crop insurance	.49	.15	.33	.09	.21	.38	
Use of general farm machinery	.71	1.53	1.25	2.28	1.20	1.62	
Use of tractor and combine	.28	.38	.24	.72	.25	.60	
Loss on abandoned acreage			2.47	.02	3.38	.94	
Overhead	1.48	2.10	1.78	2.28	1.77	1.86	
Total	13.10	19.09	18.72	21.38	18.93	19.08	100.0
Credits	.37	.10	.69	.26	.34	.43	
Net operating expense:							
Per acre	12.73	18.99	18.03	21.12	18.59	18.65	
Per bushel	.90	1.30	1.49	1.15	1.96	1.25	
Interest on investment:							
Land and machinery	5.10	10.63	6.59	9.43	3.23	7.65	
Net cost, including interest:							
Per acre	17.83	29.62	24.62	30.55	21.82	26.30	
Per bushel	1.26	2.03	2.03	1.66	2.30	1.80	

TABLE 14.—*Summary of average net cost per acre and per bushel to tenant operators, winter wheat, 1920.*

(251 rented farms).

Items.	Missouri.		Nebraska.		
	Pike County.	Carroll County.	Gage County.	Clay County.	Cheyenne County.
Average yield per acre (bu)	10.6	18.2	17.8	10.5	16.2
Tenant share of yield (bu)	5.6	10.2	10.8	7.0	10.4
Operating expenses per acre:					
Labor and power—					
Prepare land and seed—					
Man labor	$2.01	$1.86	$1.52	$1.24	$0.89
Horse power	4.03	3.08	2.76	2.45	.29
Contract labor	.....	.09	.20	.....	.28
Harvest and market—					
Man labor	2.60	4.05	4.00	3.45	3.47
Horse power	1.29	1.36	1.62	1.41	.92
Contract labor	.15	.03	.06	.01	.43
Material costs—					
Seed	1.06	1.22	2.22	2.64	1.55
Twine	.22	.40	.42	.39	.32
Manure and straw	.28	.12	.22	.09	.01
Fertilizer	.75	.....	.....	.....	.....
Threshing	1.21	3.12	1.94	1.61	1.50
Other costs—					
Taxes and insurance	.....	.....	.....	.....	.....
Special crop insurance	.01	.16	.14	.13	1.31
Use of general farm machinery	1.78	1.61	1.92	1.45	1.06
Use of tractor and combine	.....	1.14	.20	.16	2.84
Loss on abandoned acreage	.39	.....	.39	1.54	.23
Overhead	1.59	1.79	1.76	1.56	1.46
Total	17.37	20.03	19.37	18.13	16.56
Credits	.58	31	.24	.17	1.12
Net operating expense:					
Per acre	16.79	19.72	19.13	17.96	15.44
Per bushel	3.01	1.95	1.77	2.57	1.48
Interest on investment:					
Machinery	.47	.64	.53	.46	.69
Net cost including interest:					
Per acre	17.26	20.36	19.66	18.42	16.13
Per bushel	3.09	2.00	1.82	2.63	1.54

TABLE 14.—*Summary of average net cost per acre and per bushel to tenant operators, winter wheat, 1920*—Continued.

Item.	Kansas.			Oklahoma.		All winter wheat.	Per cent of operating cost.
	Thomas County.	McPherson County.	Pawnee County.	Garfield County.	Woodward County.		
Average yield per acre (bu)	13.2	12.3	12.3	17.8	11.1	14.3	.....
Tenant share of yield (bu)	8.7	8.2	8.2	11.5	7.6	9.2	.....
Operating expense per acre:							
Labor and power—							
Prepare land and seed	.....	.....	.....	.....	.....	.....	17.0
Man labor	$0.49	$1.36	$0.70	$1.50	$1.29	$1.09	.....
Horse power	.75	1.75	1.24	2.32	2.33	1.59	.....
Contract labor	.24	.....	.20	.07	.....	.15	.....
Harvest and market	.....	.....	.....	.....	.....	.....	26.8
Man labor	2.81	3.04	2.98	2.54	2.53	3.11	.....
Horse power	.93	.94	.96	1.00	1.15	1.05	.....
Contract labor	.55	.03	.52	.16	.16	.30	.....
Material costs	.....	.....	.....	.....	.....	.....	12.6
Seed	1.27	2.38	1.94	2.11	1.49	1.78	.....
Twine	.02	.28	.07	.39	.....	.23	.....
Manure and straw	.01	.09	.02	.08	.07	.06	.....
Fertilizer	.....	.....	.....	.....	.....	.02	.....
Threshing	1.79	2.05	2.40	4.50	2.33	2.30	13.9
Other costs	.....	.....	.....	.....	.....	.....	29.7
Taxes and insurance	.....	.....	.....	.....	.....	.....	.....
Special crop insurance	.70	.12	.88	.15	.04	.56	.....
Use of general farm machinery	.94	1.24	.99	1.67	1.07	1.25	.....
Use of tractor and combine	.45	1.57	.39	.86	.....	1.01	.....
Loss on abandoned acreage	.49	.03	1.11	.....	.86	.48	.....
Overhead	1.34	1.78	1.65	2.20	1.71	1.64	.....
Total	12.78	16.66	16.05	19.55	15.03	16.62	100.0
Credits	.09	.03	.86	.27	.34	.47	.....
Net operating expense:							
Per acre	12.69	16.63	15.19	19.28	14.69	16.15	.....
Per bushel	1.47	2.03	1.86	1.68	1.94	1.77	.....
Interest on investment:							
Machinery	.48	.62	.43	.75	.35	.56	.....
Net cost including interest:							
Per acre	13.17	17.25	15.62	20.03	15.04	16.71	.....
Per bushel	1.51	2.11	1.91	1.75	1.98	1.83	.....

A COMPARISON OF COSTS IN REGIONS OF WIDELY DIFFERENT LAND VALUES.

That a fairly direct relation exists between the average regional value of wheat land and the average operating expense per acre is shown in Table 15. Generally speaking, the regions of high land values and high operating costs are regions of high yields. The tendency for the several cost factors comprising the total operating expense to increase as land values became higher was most pronounced in the case of labor and materials. The expense per acre for labor in the regions having the highest land values was about 50 per cent greater than in the regions with the lowest land values.

The relatively high acre cost in Woodward County, Okla., a region of comparatively low land values, was due mainly to an abandoned wheat acreage charge of $3.38 per acre.

TABLE 15.—*Relation of average wheat land values to the average operating expense and average net cost per acre by counties, winter wheat, 1920.*

(152 owned farms).

State and county.	Number of farms.	Average value of wheat land per acre.	Operating expense per acre.						Net cost per acre including interest.
			Labor.	Materials.	Abandoned acreage.	Threshing.	Other.	Total.	
Oklahoma:									
Woodward County	28	$40	$7.88	$1.85	$3.38	$2.03	$3.79	$18.93	$21.82
Kansas:									
Thomas County	19	68	6.19	1.61	.....	2.10	3.20	13.10	17.83
Pawnee County	15	86	7.24	2.37	2.47	2.34	4.30	18.72	24.62
Nebraska:									
Cheyenne County	18	114	6.48	2.06	.18	1.78	8.14	18.64	27.25
Oklahoma:									
Garfield County	31	123	8.07	2.77	.02	4.33	6.19	21.38	30.55
Kansas:									
McPherson County	11	144	8.47	2.95	.....	2.53	5.14	19.09	29.62
Nebraska:									
Clay County	13	187	9.99	3.15	1.33	1.75	4.00	20.22	33.60
Gage County	17	233	11.78	3.50	.08	2.28	5.44	23.08	37.24

VARIATION IN NET COST PER ACRE.

All owned farms have been classified by counties in Table 16 according to the net cost per acre in order to indicate the number of farms and the percentage of acreage and total production that fall within the several acre-cost groups. This classification shows that approximately 49 per cent of all farms, 42 per cent of the harvested acreage, and 47 per cent of the total production, fall within the $25 to $35 cost group. The number of farms in each of the other two groups was about the same, approximately 25 per cent having costs of under $25, and 26 per cent having costs of $35 and over per acre. However, the wheat acreage per farm was much larger on the farms having a cost of under $25, than on the farms with costs per acre of $35 and over.

The average cost for all owner operators was $26.30 per acre. Approximately 34 per cent of these operators grew about 59 per cent of the harvested acreage and produced 50 per cent of the total production, at or below the average cost per acre. The range in cost per acre for individual farms was from $13.49 to $54.86. The farm with the lowest cost was in Woodward County, Okla., and had a very low labor expense, and a low charge for interest on investment. On the other hand, the farm with the highest cost, which was in Pike County, Mo., had a relatively high expense for fertilizer, interest on investment and an abandoned acreage charge for over half of the seeded acreage.

Seventy-eight per cent of the farms with costs of under $25 per acre were located in Thomas and Pawnee Counties, Kans., and Woodward County, Okla. Ninety-five per cent of the farms in Thomas County were in this cost group. The interest on investment, use cost of machinery, and the charge for loss due to abandoned wheat acreage, were relatively low for these farms.

Of the farms having costs of from $25 to $35 per acre, 46 per cent were located in Pike County, Mo., and Garfield County, Okla. Sixty-

four per cent of the farms in Pike County, and 74 per cent in Garfield County, fall within this cost group.

A comparison of the first two cost groups in Table 17 shows that, of the relative increase in the various items in the second, over those in the first cost group, labor and power and interest on investment are the items showing the greatest increase. The increase in material costs for the farms in the second group was due mainly to a cost for commercial fertilizer of $2.65 per acre in Pike County, Mo., the only region where commercial fertilizer was applied to the wheat land.

Sixty-eight per cent of the farms with costs of $35 and over were in the two Missouri counties and in Gage County, Nebr. These farms are located in regions of relatively high land values and here again the increase in the items of cost was most pronounced in the case of labor and power and interest on investment together with the abandoned acreage charge.

TABLE 16.—*Variation in net cost per acre by counties, winter wheat, 1920.*

(216 owned farms.)

State and county.	Number of farms with an acre cost of—			Total number of farms.
	Under $25.	$25 to $35.	$35 and over.	
Missouri:				
Pike County	2	25	12	39
Carroll County	1	11	13	25
Nebraska:				
Gage County	.....	4	13	17
Clay County	.....	8	5	13
Cheyenne County	4	12	2	18
Kansas:				
Thomas County	18	1	.....	19
McPherson County	2	8	1	11
Pawnee County	10	4	1	15
Oklahoma:				
Garfield County	3	23	5	31
Woodward County	15	9	4	28
Total	55	105	56	216
Percentage of total farms	25.5	48.6	25.9	100.0
Cumulative percentage of total farms	25.5	74.1	100.0	.....
Percentage of harvested acreage	44.5	42.0	13.5	100.0
Cumulative percentage of harvested acres	44.5	86.5	100.0	.....
Percentage of total production	37.4	46.5	16.1	100.0
Cumulative percentage of total production	37.4	83.9	100.0	.....

TABLE 17.—*Distribution of items of cost, by cost per acre groups, winter wheat, 1920.*

(216 owned farms.)

Net cost per acre.	Number of farms.	Average yield (bushels).	Cost per acre.						Credit per acre.	Total net cost per acre.
			Labor and power.	Materials.	Abandoned acreage.	Interest on investment.	Other.	Total gross cost.		
Under $25	55	12.5	$7.09	$1.89	$0.35	$5.20	$5.47	$20.00	$0.50	$19.50
$25 to $35	105	16.5	9.08	3.04	.84	9.00	7.80	29.76	.34	29.42
$35 and over	56	17.8	12.04	3.77	3.21	11.56	8.90	39.48	.46	39.02
All farms	216	14.9	8.61	2.62	.94	7.65	6.91	26.73	.43	26.30

VARIATION IN NET COST PER BUSHEL.

The array of farms with respect to variation in net cost per bushel by counties (Table 18) shows that the $1 to $2 and the $2 to $3 groups are of about equal importance in McPherson and Pawnee Counties, Kans., while in the two Missouri counties and in Woodward County, Okla., the number of farms with a cost of from $2 to $3 per bushel predominated. Of the 72 farms represented, in the $2 to $3 group, 26 per cent were in Pike County, Mo., 18 per cent in Carroll County, Mo., and 17 per cent in Woodward County, Okla. Fifty per cent of the farms with costs of $4 and over per bushel were in Pike County, Mo. Of all farms, 53 per cent were in the $1 to $2 group, 33 per cent in the $2 to $3 group and 8 per cent in the $3 to $4 group. Of the total acreage, 66 per cent was in the $1 to $2 group, 26 per cent in the $2 to $3 group, and 4 per cent in the $3 to $4 group. Of the total production, 97 per cent was in the two lowest cost groups.

These relations are more striking when a comparison is drawn between the total number of farms, total acreage, and total production in the first two cost groups, which is as follows: Variation in cost, $1 to $2; percentage of all farms, 53; percentage of acreage, 66; percentage of production, 76; $2 to $3 group, percentage of all farms, 33; percentage of acreage, 26; percentage of production, 21.

TABLE 18.—*Variation in net cost per bushel by counties, winter wheat, 1920.*

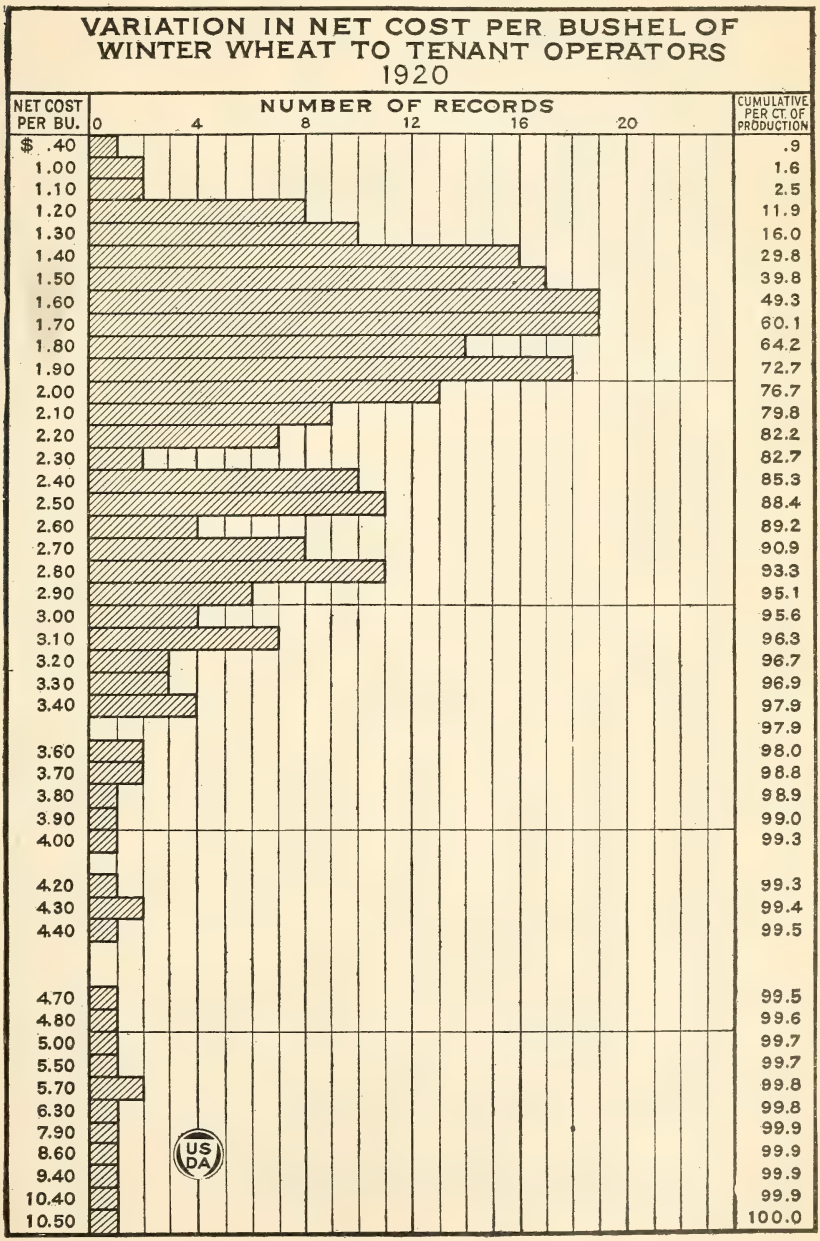
(216 owned farms.)

State and county.	Net cost per bushel.											
	$1 to $2.			$2 to $3.			$3 to $4.			$4 and over.		
	Number of farms.	Percentage of acreage.	Percentage of production.	Number of farms.	Percentage of acreage.	Percentage of production.	Number of farms.	Percentage of acreage.	Percentage of production.	Number of farms.	Percentage of acreage.	Percentage of production.
Missouri:												
Pike County	7	17	25	19	58	60	7	15	10	6	10	5
Carroll County	10	43	51	13	49	44	2	8	5	.....	.....	.....
Nebraska:												
Gage County	12	74	81	5	26	19	.....	.....	.....	.....	.....	.....
Clay County	3	36	49	4	23	25	4	28	19	2	13	7
Cheyene County	16	94	97	1	4	2	1	2	1	.....	.....	.....
Kansas:												
Thomas County	19	100	100	.....	.....	.....	.....	.....	.....	.....	.....	.....
McPherson County	5	49	62	5	42	33	1	9	5	.....	.....	.....
Pawnee County	7	42	51	7	50	46	.....	.....	.....	1	8	3
Oklahoma:												
Garfield County	25	84	88	6	16	12	.....	.....	.....	.....	.....	.....
Woodward County	10	41	51	12	46	38	3	6	6	3	7	5
All farms	114	66	76	72	26	21	18	4	2	12	4	1

The variation in the cost per bushel for all farms according to tenure is illustrated in Tables 19 and 20 and in Figures 7 and 8.

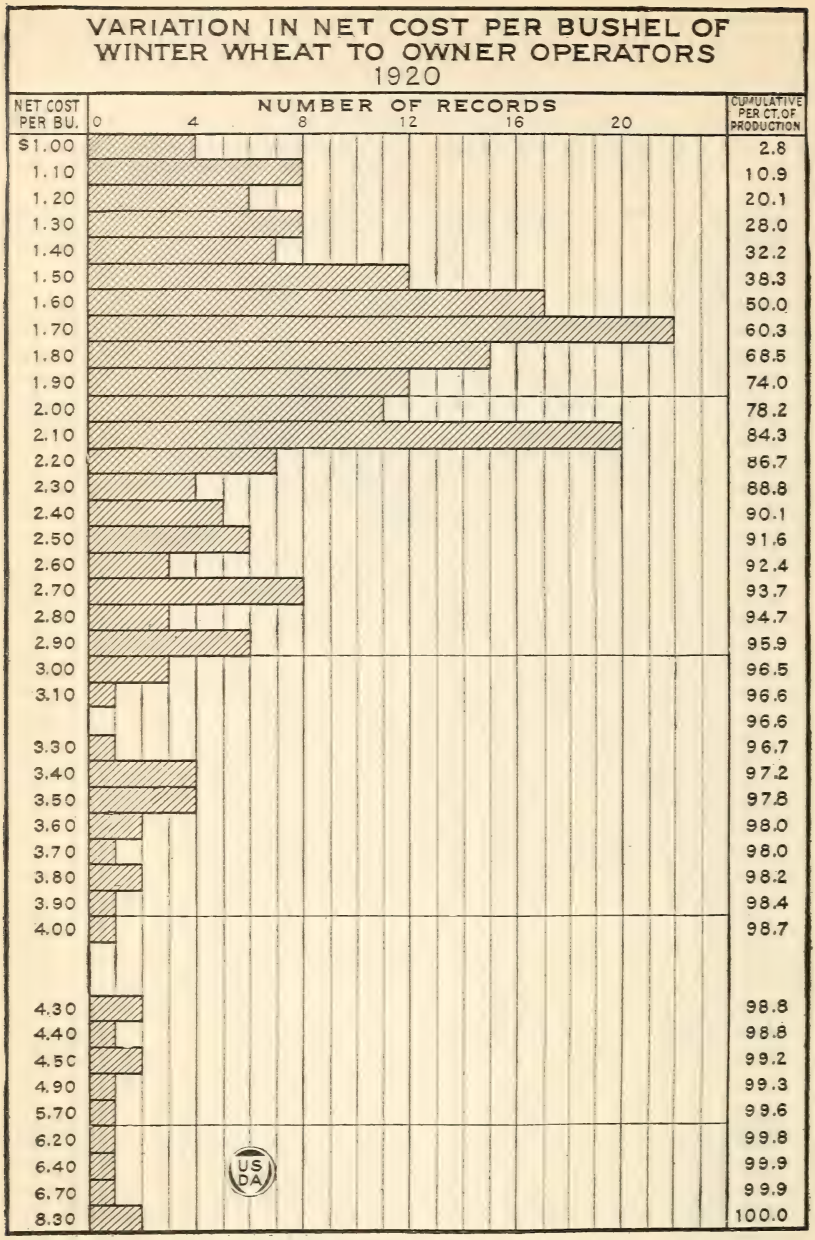
Yield per acre is the factor largely responsible for the grouping of the farms having extremely high or low costs per bushel. The yields for the owner-operators having costs of $1.20 or under per bushel ranged from 12 to 31 bushels per acre. On the other hand, those having a cost of $4 or more per bushel had yields which ranged

from slightly less than 3 to 7 bushels per acre. The yield for tenant-operators in the $1.20 per bushel or under cost group ranged from 12 to 25 bushels, while those with costs of $4 or over per bushel had yields from 3 to 7 bushels per acre.



(251 rented farms.)

FIG. 7.—The average net cost per bushel for all tenant operators was $1.83 or 3 cents greater than for owner operators. Forty-seven per cent of the tenants, producing 71 per cent of the total yield on rented farms, had costs at or below the average.



(216 owned farms.)

FIG. 8.—The average net cost per bushel for all owner operators was $1.80. Approximately 46 per cent of these operators grew about 60 per cent of the harvested acreage and produced 68 per cent of the total yield on owned farms at or below the average cost per bushel.

TABLE 19.—*Variation in net cost per bushel of winter wheat to owner-operators, 1920.*
(216 owned farms.)

Net cost per bushel.[1]	Number of farms.	Cumulative percentage of number of farms.	Acres.		Cumulative percentage of harvested acreage.	Production (bushels).	Cumulative production (bushels).	Cumulative percentage of production.
			Seeded.	Harvested.				
$1.00	4	1.9	420	420	2.2	7,860	7,860	2.8
1.10	8	5.6	1,190	1,190	8.6	22,565	30,425	10.9
1.20	6	8.3	1,580	1,580	16.9	25,860	56,285	20.1
1.30	8	12.0	1,198	1,198	23.3	21,972	78,257	28.0
1.40	7	15.3	648	648	26.8	11,905	90,162	32.2
1.50	12	20.8	935	934	31.7	17,144	107,306	38.3
1.60	17	28.7	2,091	2,091	42.8	32,525	139,831	50.0
1.70	22	38.9	1,952	1,632	51.5	28,843	168,674	60.3
1.80	15	45.8	1,568	1,518	59.6	23,087	191,761	68.5
1.90	12	51.4	1,229	1,039	65.1	15,437	207,198	74.0
2.00	11	56.5	807	774	69.2	11,590	218,788	78.2
2.10	20	65.7	1,310	1,265	75.9	17,062	235,850	84.3
2.20	7	69.0	595	592	79.1	6,897	242,747	86.7
2.30	4	70.8	579	457	81.5	5,860	248,607	88.8
2.40	5	73.1	330	315	83.2	3,602	252,209	90.1
2.50	6	75.9	573	543	86.0	4,090	256,299	91.6
2.60	3	77.3	245	225	87.2	2,452	258,751	92.4
2.70	8	81.0	413	383	89.3	3,639	262,390	93.7
2.80	3	82.4	375	190	90.3	2,615	265,005	94.7
2.90	6	85.2	343	317	92.0	3,550	268,555	95.9
3.00	3	86.6	232	182	92.9	1,664	270,219	96.5
3.10	1	87.0	20	20	93.0	200	270,419	96.6
3.20		87.0			93.0			96.6
3.30	1	87.5	35	35	93.2	350	270,769	96.7
3.40	4	89.4	168	166	94.1	1,391	272,160	97.2
3.50	4	91.2	208	178	95.0	1,513	273,673	97.8
3.60	2	92.1	73	73	95.4	601	274,274	98.0
3.70	1	92.6	10	10	95.5	100	274,374	98.0
3.80	2	93.5	110	40	95.7	360	274,734	98.2
3.90	1	94.0	80	65	96.0	600	275,334	98.4
4 00	1	94.4	165	100	96.6	900	276,234	98.7
Over $4	12	100.0	1,116	644	100.0	3,672	279,906	100.0

[1] Midpoint of class

TABLE 20.—*Variation in net cost per bushel of winter wheat to tenant-operators, 1920.*
(251 rented farms.)

Net cost per bushel.[1]	Number of farms.	Cumulative percentage of number of farms.	Production (bushels).[2]	Cumulative production (bushels).[2]	Cumulative percentage of production.[2]
$0.40	1	0.4	2,360	2,360	0.9
1.00	2	1.2	1,927	4,287	1.6
1.10	2	2.0	2,503	6,790	2.5
1.20	8	5.2	25,329	32,219	11.9
1.30	10	9.2	11,244	43,363	16.0
1.40	16	15.5	37,231	80,594	29.8
1.50	17	22.3	27,238	107,832	39.8
1.60	19	29.9	25,593	133,425	49.3
1.70	19	37.5	29,146	162,571	60.1
1.80	14	43.0	11,091	173,662	64.2
1.90	18	50.2	23,178	196,840	72.7
2.00	13	55.4	10,647	207,487	76.7
2.10	9	59.0	8,477	215,964	79.8
2.20	7	61.8	6,559	222,523	82.2
2.30	2	62.5	1,395	223,918	82.7
2.40	10	66.5	6,815	230,733	85.3
2.50	11	70.9	8,419	239,152	88.4
2.60	4	72.5	2,253	241,405	89.2
2.70	8	75.7	4,480	245,885	90.9
2.80	11	80.1	6,708	252,593	93.3
2.90	6	82.5	4,783	257,376	95.1
3.00	4	84.1	1,427	258,803	95.6
3.10	7	86.9	1,878	260,681	96.3
3.20	3	88.0	1,007	261,688	96.7
3.30	3	89.2	504	262,192	96.9
3.40	4	90.8	2,675	264,867	97.9
3.50		90.8			97.9
3.60	2	91.6	388	265,255	98.0
3.70	2	92.4	2,115	267,370	98.8
3.80	1	92.8	262	267,632	98.9
3.90	1	93.2	217	267,849	99.0
4.00	1	93.6	900	268,749	99.3
Over $4	16	100.0	1,895	270,644	100.0

[1] Mid-point of class. [2] Only the tenant-operator's share of the production is shown in the above table.

EFFECT OF YIELD ON COST PER BUSHEL.

The cost of producing a bushel of wheat is a figure much desired by all wheat farmers and since this cost depends so largely upon yield it is essential to analyze the yield factor in its relation to the cost per bushel. Here again it is desirable to study the range in yield, together with the range in cost per bushel, since the cost per bushel based on the average yield might be interpreted to mean that all the wheat in a given region was produced at a loss, whereas as a matter of fact there might be many farmers producing at a substantial profit.

The average yield per acre for the farms studied in 1920 was 14.3 bushels per acre as compared with a yield of 15.3 bushels per acre for all United States winter wheat. (See Table 21.) Seventy per cent of the farmers visited obtained wheat yields ranging from 7 to 19 bushels per acre; 6 per cent had yields of less than 7 bushels; and 24

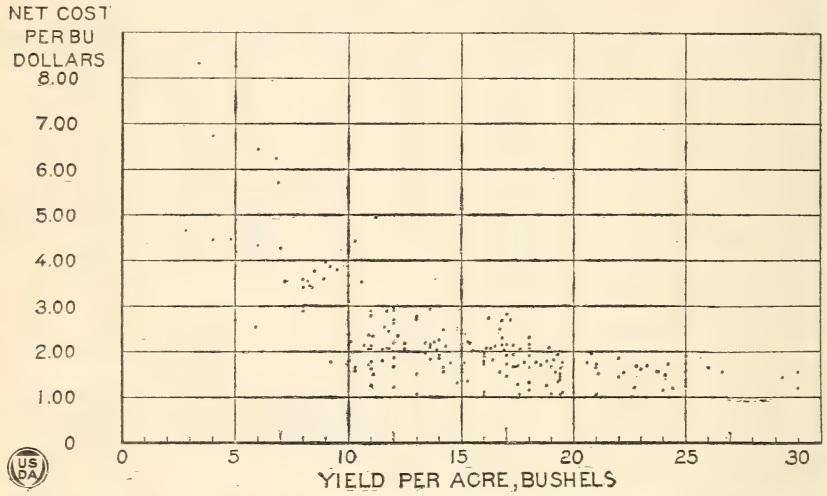


FIG. 9.—Relation of yield per acre to net cost per bushel of producing wheat—1920—216 owned farms. Each dot represents one farm, and its position indicates the yield and net cost per bushel of wheat on that farm. The cost per bushel for those farmers who had a yield of from 19 to 25 bushels per acre was 31 per cent less than for those having a yield of from 7 to 13 bushels. The average yield per acre was 14.9 bushels.

per cent had yields of over 19 bushels per acre. Five per cent had yields of over 25 bushels per acre.

The cost per bushel in relation to yield for a particular year may be the cause of misleading conclusions as to the efficiency which has been exercised in production. High costs per bushel may be due to causes which are not a result of lack of skill in management. A farmer may handle his crop according to approved methods of production only to have the crop destroyed by insects, fungous diseases, or climatic factors over which he has no control. The comparatively low yield in Pike County, Mo., was influenced by a period of wet weather at seeding time, followed by an infestation of the growing crop by the Hessian fly at the beginning of warm weather in the early spring. Chinch bugs also caused appreciable damage. In Clay County, Nebr., heavy windstorms in the early spring followed by damage from black rust just prior to the harvest period, were contributing factors; while in Cheyenne County, Nebr., hail damage and

rust injury were the chief causes of low yields. The experience of wheat growers has been that if they can withstand the losses due to occasional crop failures they may hope to realize a compensating income during the good years. Were it not for a realization of these things an exceedingly bad year might induce many farmers to go out of the business.

The influence of yield on the cost of producing a bushel of wheat is illustrated in Table 22 and in Figure 9. In general, as the yield per acre increased the cost per bushel decreased. A comparison of the cumulative percentage of harvested acreage and cumulative percentage of production indicates that 49 per cent of the total harvested acreage and 35 per cent of the total production was on farms having yields of less than the average yield per acre.

TABLE 21.—*Annual wheat yields.*

Regions.	State average.[1]	County average.[2]	1920 average yields on farms visited.	Percentage of total number of farms with yields per acre of—				
				Under 7 bushels.	7 to 13 bushels.	13 to 19 bushels.	19 to 25 bushels.	25 bushels and over.
	Bushels.	*Bushels.*	*Bushels.*					
Missouri	14.2							
Pike County		15.2	12.1	11.8	42.4	37.3	5.1	3.4
Carroll County		16.5	18.1	3.4	15.3	33.9	30.5	16.9
Nebraska	16.1							
Gage County		18.4	18.9		6.5	37.0	43.5	13.0
Clay County		17.1	11.3	14.9	61.7	21.3	2.1	
Cheyenne County		19.9	16.7	6.5	15.2	41.3	23.9	13.1
Kansas	14.0							
Thomas County		12.5	13.7	1.6	36.5	55.6	6.3	
McPherson County		14.8	12.8		58.5	31.7	7.3	2.5
Pawnee County		12.6	12.5	4.3	55.3	14.9	25.5	
Oklahoma	12.5							
Garfield County			18.1		6.6	49.2	42.6	1.6
Woodward County			10.7	13.0	66.7	16.6	3.7	
All farms			14.3	5.6	35.5	34.8	19.1	5.0

[1] Ten-year average from records of the Bureau of Crop Estimates, U. S. Department of Agriculture.
[2] Seven to 10 year average from records of State boards of agriculture. No data were obtainable for average county yields in Oklahoma.

TABLE 22.—*Relation of yield to cost per bushel, winter wheat, 1920.*

(216 owned farms.)

Variation in yield.	Number of farms.	Average yield (bushels).	Acres harvested.	Cumulative acres harvested.	Cumulative percentage of harvested acreage.	Production (bushels).	Cumulative production (bushels).	Cumulative percentage of production.	Average cost per bushel.
Under 7 bushels	11	5.4	1,214	1,214	6	6,608	6,608	2	$3.95
7 to 12.9 bushels	66	10.7	6,163	7,377	39	65,820	72,428	26	2.11
13 to 18.9 bushels	84	15.9	6,917	14,294	76	109,870	182,298	65	1.72
19 to 24.9 bushels	43	20.8	3,981	18,275	97	82,706	265,004	95	1.46
25 bushels and over	12	27.1	549	18,824	100	14,902	279,906	100	1.37

USE OF QUANTITY REQUIREMENTS OF LABOR AND MATERIALS IN COMPUTING COSTS.

A knowledge of the quantity requirements of labor and materials makes it possible to compute approximate costs for a given year, providing prices and yields are known. Table 23 is presented as an example to show how current rates have been applied to the quantity

requirements of labor and materials in computing the average regional cost of producing winter wheat in McPherson County, Kans., for 1922.

So long as the ratio of the total costs of these quantitative requirements to the total operating expense remains fairly constant and constitutes a relatively large percentage of the total operating expense, they serve as valuable basic data for computing costs.

TABLE 23.—*Estimated cost of producing winter wheat, McPherson County, Kans., 1922.*[1]

Items.	Amount per acre.	Estimated rate.	Cost per acre.
Labor:			
Prepare land and seed—			
Man hours	4.5	$0.20	$0.90
Horse hours	18.5	.15	2.78
Harvest and market—			
Man hours	4.0	.45	1.80
Horse hours	7.5	.15	1.12
Seed, bushels	1.1	1.50	1.65
Twine, pounds	2.0	.125	.25
Threshing, bushels	15.0	.12	1.80
Total labor, seed, twine and threshing or 73 per cent [2] of the operating expense			10.30
Total operating expense (100 per cent)			14.10
Use of land	$110	6%	6.60
Total cost			20.70
Credits			.10
Total net cost per acre			20.60
Total net cost per bushel (15 bushel yield)			1.37

[1] Binder cut grain threshed from shock, bundle haulers furnished by farmer and field pitchers by the thresherman.

[2] From the 1920 cost figures.

SUMMARY OF LABOR PRACTICES.

Summaries of the labor practices, showing the average time and the percentage of the total acreage covered by each field operation are given in Tables 24 to 27.

With the exception of the two Missouri counties and Gage County, Nebr., the use of manure on wheat land was not common. In many instances straw and manure were applied more for the purpose of preventing soil blowing than as a plant food. This was especially true in Woodward County, Okla. Since farm manure was applied only on selected parts of the wheat fields, it was difficult to determine the exact acreage covered, hence the man and horse requirements for its application have been omitted from these tables.

Tillage practices in the preparation of a suitable seed bed were not uniform. As an example of variation in practice, a farmer might plow a part of his acreage, list a part, and disk drill the remainder on stubble land without further preparation. Of the total wheat acreage studied, 12 per cent was listed and 50 per cent was plowed. (See Fig. 10.) Thirty-six per cent of all land plowed was with tractor power. In Pike County, Mo., 75 per cent of the total acreage was plowed. The remaining 25 per cent was mainly corn land most of which was disk-harrowed instead of plowed. In Cheyenne County, Nebr., 55 per cent or the total acreage was plowed, the remaining acreage being principally wheat stubble land which was disk-harrowed instead of plowed. The lister was substituted for the plow on

19 per cent of the acreage in Pawnee County, Kans., and on 60 per cent of the wheat acreage in Woodward County, Okla. The disk harrow was used in all districts visited. Likewise the spike-tooth harrow was common to all districts except Thomas County, Kans., where, on account of large volunteer wheat acreages, a minimum amount of seed bed preparation was required. Sixty-five per cent of the wheat acreage in Cheyenne County, Nebr., was tractor disked and twenty-two per cent of the wheat acreage in McPherson County, Kans., was tractor harrowed.

The number of times the land was covered with the disk harrow varied from once in Clay County, Nebr., and McPherson County, Kans., to 1.5 times in Cheyenne County, Nebr. Likewise the range in the use of the spike-tooth harrow was from 1.1 times in Woodward

FIG. 10.—Plowing sod land for wheat with a 5-horse, 2-bottom plow. The 2-bottom gang plow was the most common size where horses were used in plowing.

County, Okla., to 2.3 times in McPherson County, Kans. The work of seeding was done with both horse and tractor power, although mainly with horses. (See Fig. 11.)

Harvesting with the binder was the common practice in all districts except Thomas and Pawnee Counties, Kans., and Woodward County, Okla. Ninety-four per cent of the acreage in Woodward County, 94 per cent in Thomas County, and 84 per cent in Pawnee County was harvested with a header. One per cent of the acreage in Pawnee County, Kans., 6 per cent in Garfield County, Okla., and 21 per cent in Cheyenne County, Nebr., was harvested with a combine.

In all districts except McPherson County, Kans., most of the bundle grain was shock threshed, the headed grain all being threshed from stacks in the field. Of the bundle grain production for McPherson County, 59 per cent was shock threshed, and 41 per cent threshed from stacks in the field. Of the total bundle grain produced in all districts, 91 per cent was shock-threshed and 9 per cent stack threshed.

Except in the two Missouri counties, from about 10 to 20 per cent of the total harvested grain was hauled direct from the separator to local elevators, the remainder being stored on the farm and hauled as time permitted. In Pike County, Mo., 62 per cent, and in Carroll County, Mo., 46 per cent of the harvested grain was hauled direct to local elevators.

FIG. 11.—Drilling wheat with horse and with tractor power. Tractor power for drilling wheat was not common except in Cheyenne County, Nebr.

TABLE 24.—*Summary of labor practices in Missouri, winter wheat, 1920.*

Operations.	Pike County.				Carroll County.			
	Records.	Acreage.[1]	Average hours per acre.		Records.	Acreage.[1]	Average hours per acre.	
	Per cent.	*Per cent.*	*Man.*	*Horse.*	*Per cent.*	*Per cent.*	*Man.*	*Horse.*
Manure	49	33			44	38		
Straw	2	[2]			2	4		
Plow	87	68	3.3	11.5	89	72	3.7	13.4
Plow (tractor)	4	7	1.6		15	27	1.6	
Disk[3] (no lap)	49	32	1.5	5.1	17	17	1.2	4.7
Disk (lap)	56	37	2.3	8.7	46	36	1.7	6.7
Disk (tractor)	4	8	1.0		7	11	1.4	
Harrow[4]	96	92	1.0	3.8	91	78	1.3	5.1
Harrow (tractor)	2	4	.8		11	21	.6	
Roll					7	10	.5	1.8
Drag	27	23	.8	3.0	6	5	.8	3.3
Haul fertilizer	93	91	.4	.8				
Clean Seed	53	58	.3		44	54	.3	
Treat Seed	2	[2]	.4		22	22	.1	
Drill	[5] 100	100	1.0	3.4	98	98	.9	3.1
Drill (tractor)					2	2	.9	
Cut (binder)	98	97	.8	3.2	83	65	.8	3.2
Cut (binder tractor)	2	3	1.7		19	35	1.2	
Shock	100	100	1.4		100	100	1.6	
Reshock	22	26	.4		61	61	.4	
Stack	5	2	3.3	3.5	13	6	4.0	4.1
Haul fuel	62	65	.2	.3	70	71	.2	.3
Thresh from stack	5	2	2.0		13	4	1.6	
Thresh from shock	95	98	3.2	3.6	87	96	4.1	4.8
Haul to granary	57	38	.7	1.0	61	54	1.0	1.5
Haul from granary to market	57	38	1.1	2.2	61	54	1.9	3.8
Haul from machine to market	58	62	1.1	2.2	48	46	1.4	2.9

[1] Threshing and hauling percentages are based on bushels.
[2] Less than 1 per cent.
[3] Disking was done 1.4 times in Pike County and 1.1 times in Carroll County.
[4] Harrowing was done 1.6 times in Pike County and 2 times in Carroll County.
[5] Includes drilling fertilizer.

TABLE 25.—*Summary of labor practices in Kansas, winter wheat, 1920.*

Operations.	Thomas County.				McPherson County.				Pawnee County.			
	Records.	Acreage.[1]	Average hours per acre.		Records.	Acreage.[1]	Average hours per acre.		Records.	Acreage.[1]	Average hours per acre.	
	Per cent.	*Per cent.*	*Man.*	*Horse.*	*Per cent.*	*Per cent.*	*Man.*	*Horse.*	*Per cent.*	*Per cent.*	*Man.*	*Horse.*
Manure	10	11	.....	.....	35	20	.....	.....	21	21	.....	.....
Straw	2	(2)	.....	.....	16	5	.....	.....	2	2	.....	.....
Plow	24	6	2.0	8.2	81	53	2.8	11.1	48	19	2.6	11.8
Plow (tractor)	19	10	1.1	.....	35	38	1.4	.....	19	9	1.2	.....
Disk[3] (lap)	31	23	1.5	6.4	27	7	1.5	6.0	45	22	1.7	8.2
Disk (no lap)	31	14	1.4	5.6	19	12	.9	3.8	19	12	1.1	4.9
Disk (tractor)	2	1	.5	.....	5	2	.9	.....	19	10	.5	.....
Harrow[4]	.....	.....	.....	.....	86	79	1.0	4.7	64	42	.4	2.3
Harrow (tractor)	.....	.....	.....	.....	22	22	.6	.....	7	7	.3	.....
List	7	3	1.4	5.7	.....	.....	.....	.....	29	13	1.2	5.6
List (tractor)	.....	.....	.....	.....	.....	.....	.....	.....	12	6	.5	.....
Sled	7	3	1.1	4.3	.....	.....	.....	.....	14	10	1.1	4.3
Clean seed	.....	.....	.....	.....	32	37	.1	.....	2	3	.1	.....
Treat seed	.....	.....	.....	.....	.....	.....	.....	.....	5	4	.9	.....
Drill	83	76	.6	2.7	92	90	.7	2.7	93	86	.6	2.6
Drill (tractor)	17	24	.3	.....	8	10	.4	.....	14	14	.4	.....
Head and stack	88	86	2.6	4.1	22	18	2.9	4.4	86	75	2.8	4.3
Head and stack (tractor)	10	8	1.2	.....	.....	.....	.....	.....	7	9	.7	[5] 4
Combine (tractor)	.....	.....	.....	.....	.....	.....	.....	.....	2	1	1.0	.....
Cut (binder)	5	3	.5	2.3	78	57	.7	2.8	36	11	.7	3.0
Cut (tractor)	5	3	.7	.....	24	25	.9	.....	10	4	1.1	.....
Shock	10	5	.7	.....	89	80	.9	.....	43	15	1.4	.....
Reshock	.....	.....	.....	.....	35	40	.2	.....	5	2	1.0	.....
Stack	.....	.....	.....	.....	57	37	1.8	2.4	10	1	1.6	2.0
Haul fuel	45	45	.1	.1	51	51	.1	.1	76	77	.1	.1
Thresh from stack (bundle grain)	.....	.....	.....	.....	54	33	1.1	.....	10	1	(6)	(6)
Thresh from stack (headed grain)	98	94	(6)	(6)	22	19	(6)	(6)	93	84	(6)	(6)
Thresh from shock	10	6	(6)	(6)	49	48	1.1	2.0	38	14	1.5	3.0
Haul to granary	86	76	.7	1.1	92	79	.4	.7	98	88	.6	.9
Haul from granary to market	86	76	1.2	2.7	92	79	1.0	2.0	98	88	1.1	2.2
Haul from machine to market	38	23	(6)	(6)	27	21	.8	1.5	40	12	.9	1.9
Sold at machine	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

[1] Threshing and hauling percentages based on bushels.
[2] Less than 1 per cent.
[3] Disking is done 1.2 times in Thomas County, 1 time in McPherson County, and 1.2 times in Pawnee County.
[4] Harrowing is done 2.3 times in McPherson County and 1.2 times in Pawnee County.
[5] Barges.
[6] Contract.

TABLE 26.—*Summary of labor practices in Oklahoma, winter wheat, 1920.*

Operations.	Garfield County.				Woodward County.			
	Records.	Acreage.[1]	Average hours per acre.		Records.	Acreage.[1]	Average hours per acre.	
	Per cent.	*Per cent.*	*Man.*	*Horse.*	*Per cent.*	*Per cent.*	*Man.*	*Horse.*
Manure	37	27	.....	.....	42	33	.....	.....
Straw	2	1	.....	.....	42	45	.....	.....
Plow	87	76	2.5	10.6	23	12	2.5	10.8
Plow (tractor)	19	19	1.3	.....	6	7	1.3	.....
Disk[2] (lap)	22	11	1.6	6.3	21	8	1.5	6.3
Disk (no lap)	22	15	1.1	4.7	33	23	1.4	7.3
Disk (tractor)	7	4	1.0	.....	4	5	.6	.....
List	6	4	1.5	6.0	77	60	1.3	5.6
Sled	6	4	1.3	5.1	75	57	1.0	4.3
Harrow[3]	94	90	.9	4.2	60	43	.6	2.5
Harrow (tractor)	9	7	.5	.....	2	4	.5	.....
Clean seed	15	13	.1	.....	15	15	.1	.....
Drill	96	97	.7	2.8	100	100	.8	3.1
Drill (tractor)	4	3	.8	.....	.....	.....	.....	.....
Head and stack	7	7	3.2	4.9	98	94	2.5	4.4
Combine (tractor)	4	6	1.0	.....	.....	.....	.....	.....
Cut (binder)	87	78	.7	3.1	10	6	.7	3.1
Cut (tractor)	11	9	1.0	.....	.....	.....	.....	.....
Shock	96	87	1.0	.....	10	6	1.4	.....
Reshock	61	56	.3	.....	2	2	.1	.....
Stack	15	7	3.4	3.6	2	1	2.0	2.6
Haul fuel	46	49	.1	.2	44	34	.1	.3
Thresh from stack (bundle grain)	15	6	(4)	(4)	2	1	(4)	(4)
Thresh from stack (headed grain)	6	7	(4)	(4)	98	93	(4)	(4)
Thresh from shock	91	81	(4)	(4)	8	6	1.4	2.4
Haul to granary	100	89	.8	1.2	94	80	.5	.9
Haul from granary to market	100	89	1.4	2.7	94	80	1.2	2.8
Haul from machine to market	33	11	1.0	2.1	35	20	1.1	2.2

[1] Threshing and hauling percentages are based on bushels.
[2] Disking was done 1.1 times in Garfield County and 1.2 times in Woodward County.
[3] Harrowing was done 2 times in Garfield County and 1.1 times in Woodward County.
[4] Contract.

TABLE 27.—*Summary of labor practices in Nebraska, winter wheat, 1920.*

Operations.	Gage County.				Clay County.				Cheyenne County.			
	Records.	Acreage.[1]	Average hours per acre.		Records.	Acreage.[1]	Average hours per acre.		Records.	Acreage.[1]	Average hours per acre.	
	Per cent.	*Per cent.*	*Man.*	*Horse.*	*Per cent.*	*Per cent.*	*Man.*	*Horse.*	*Per cent.*	*Per cent.*	*Man.*	*Horse.*
Manure	51	30	.....	.....	40	37	.....	.....	8	3	.....	.....
Straw	2	2	.....	.....	.....	.....	.....	.....	3	(2)	.....	.....
Plow	93	91	2.9	11.5	98	92	2.4	10.9	21	5	2.5	11.7
Plow (tractor)	5	5	1.5	.....	10	8	1.1	.....	63	50	1.3	.....
Disk [3] (lap)	5	2	1.2	4.8	2	3	1.2	4.8	.....	.....	.....	.....
Disk (no lap)	12	6	.8	3.2	32	29	.8	3.2	21	7	1.8	8.7
Disk (tractor)	2	1	1.0	.....	.....	.....	.....	.....	74	65	.8	.....
Harrow [4]	95	93	1.1	4.6	95	94	.7	3.1	29	11	.5	2.1
Harrow (tractor)	.....	.....	.....	.....	.....	.....	.....	.....	3	2	.3	.....
Roll	.....	.....	.....	.....	5	7	.6	2.2	.....	.....	.....	.....
Clean seed	35	36	.2	.....	35	42	.2	.....	39	33	.1	.....
Treat seed	2	2	.1	.....	12	14	.2	.....	37	39	.1	.....
Drill	100	100	.9	3.7	100	100	.8	3.3	63	35	1.0	2.4
Drill (tractor)	.....	.....	.....	.....	.....	.....	.....	.....	53	65	.7	.....
Head and stack	.....	.....	.....	.....	.....	.....	.....	.....	5	2	2.8	2.8
Combine (tractor)	.....	.....	.....	.....	.....	.....	.....	.....	16	21	1.3	.....
Cut (binder)	98	97	.8	3.4	98	98	.7	2.8	53	35	.7	2.8
Cut (binder tractor)	5	3	.8	.....	2	2	1.0	.....	34	42	.9	.....
Shock	100	100	1.3	.....	100	100	1.0	.....	87	77	1.0	.....
Reshock	35	33	.4	.....	28	36	.4	.....	24	23	.1	.....
Stack	7	5	3.2	3.2	40	18	3.0	3.9	3	1	2.2	2.2
Haul fuel	49	45	.2	.3	80	75	.1	.2	32	24	.1	.2
Thrash from stack (bundle grain)	7	5	1.0	.....	40	15	.9	.....	3	1	1.1	.....
Thresh from stack (headed grain)	.....	.....	.....	.....	.....	.....	.....	.....	5	2	1.3	.....
Thresh from shock	93	95	3.1	3.7	75	85	2.1	3.8	84	74	1.8	3.1
Haul to granary	95	94	.6	.9	90	89	.7	1.0	95	88	.7	1.2
Haul from granary to market	95	94	1.8	3.6	90	89	.9	1.9	95	88	1.2	2.9
Haul from machine to market	5	6	3.5	6.9	22	11	.5	.8	37	12	1.0	2.1

[1] Threshing and hauling percentages are based on bushels.
[2] Less than 1 per cent.
[3] Disking was done 1.1 times in Gage County, 1.0 time in Clay County and 1.5 times in Cheyenne County.
[4] Harrowing was done 2.2 times in Gage County, 1.7 times in Clay County, and 1.5 times in Cheyenne County.

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